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SPACE CENTER Roundup

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Engineers to raise awareness of engineering profession to local students

By Mae Mangieri

Next month, 175 civil service and contractor employees will have the opportunity to elevate public awareness and appreciation of the engineering profession when they visit some 13,000 K-12 students and teachers in the local educational community as part of a national outreach program called Discover "E" ("E" for Engineering) during JSC's 9th annual National Engineers Week Program.

"Employees have signed up to provide an overwhelming 475 classroom presentations at more than 100 schools," said Nancy Robertson, chief of the Education and Community Support Branch in the Public Affairs Office. "This shows an impressive level of dedication to share their unique space-related experience to promote engineering careers."

Although National Engineers Week is February 20-26, JSC's program extends throughout the entire month of February to support the large number of requests for exhibit items and educational materials from the employees who will visit classrooms.

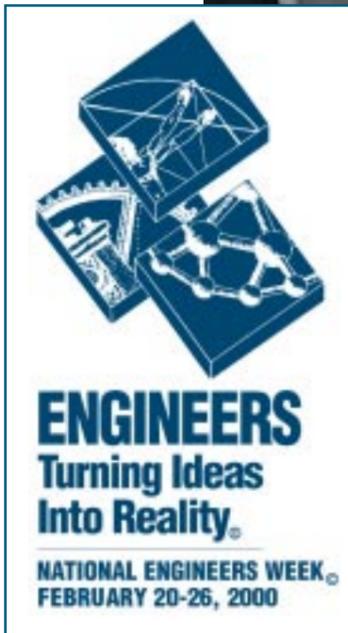
JSC's Public Affairs Office hosted four training sessions for civil service and contractor employees to bolster their confidence in providing effective classroom presentations. The training sessions included a panel of veteran JSC National Engineers Week volunteers who shared their tested classroom hands-on experiences.

"I like to talk about my field of interest – heat transfer," said Steve Rickman, deputy chief of the Thermal Branch in the Engineering Directorate. "One hands-on activity I use demonstrates the ability of different materials to conduct heat. We immerse four dissimilar rods in ice water and determine which one cools fastest. That leads to a discussion of why some materials are used for an application while others are not.



NASA JSC Photo JSC2000-00397 by Bill Stafford

JSC's National Engineers Week training members are from left, front: Robin Hart, Beverly Spiller and Mae Mangieri; middle row: Don Koonce, Rodney Rocha; left back: Delicia Slaughter, Sue Leibert, Jim Wade, Gregory Vogt, Steve Rickman, and Tom Deibel.



It really gets the kids thinking."

"I take various hardware artifacts and posters with me to the schools as talking points to focus students' attention and to help them understand the space environment and how engineers have to design specifically for it," said Norm Chaffee, a retired JSC engineer.

"I love it when I see the 'light bulbs' go on in a student's face as he or she understands a concept like microgravity, or the laws of motion."

Rodney Rocha, a JSC aerospace engineer and a National Engineers Week volunteer since the program began in 1991, explains to students the new sets of technological and social challenges they will face. "I tell kids today that there is no avoiding science and engineering. Even

before they reach adulthood, science and engineering will come knocking loudly on their doors whether or not they become engineers or scientists. It won't just be in the form of new gadgets, computers, and cool technology to use as consumers. They will also be challenged as voters deciding on action or inaction in such areas as human genetic engineering and organ transplants, the world's oil supply, what science textbooks to allow in public schools, and what kind of space program is right or too expensive. To be informed and responsible citizens, they will need to recognize new scientific terms, phrases, theories and, yes, even math statistics as presented not only in scientific journals but in the news media."

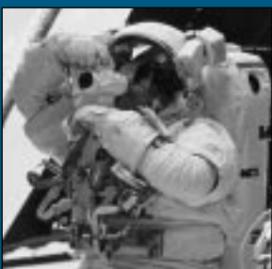
Volunteers are still needed to sign up for the remaining classroom assignments, which can be found online by visiting the National Engineers Week Web site at <http://www4.jsc.nasa.gov/scripts/eweek/>.

Volunteers are asked to commit to

giving classroom presentations to students that attend grades K-12 in schools within 50 miles of JSC during the month of February. For civil service employees, time spent participating as a National Engineers Week volunteer may be charged to the education labor code. Contractor employees need to check with their individual supervisor, human resource or payroll office for instructions on how to charge National Engineers Week volunteer time.

Other educational outreach activities that JSC will host to observe National Engineers Week include the Mars Millennium Project and the Mars Settlement Design Competition, both of which are coordinated by Norm Chaffee who can be reached at (281) 483-3777 for details.

With declining enrollment figures in the engineering fields, National Engineers Week offers a great opportunity for each of us to contribute to our community's technical education efforts. ■



Spectacular new photos from space.

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Shine your boots and get ready for rodeo.

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Shocking news for the new millennium.

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New camera improves quality of pictures taken in space

In its continuing effort to remain at the cutting edge of photographic hardware technology and in an attempt to simplify training and procedures for crews on board shuttle and station, NASA has certified the Nikon F5 for both IVA (Intravehicular Activity) and EVA (Extravehicular Activity) use.

The commercial Nikon F5 has flown IVA on STS-88 and STS-96. The F5 was successfully demonstrated for EVA use for the first time during the recent STS-103 space shuttle mission.

The Nikon F5 is expected to improve the quality of the pictures taken by astronauts during space walks. It will decrease the number of inadvertent exposures taken during EVAs and reduce the time needed to train future crews in the use of photographic equipment.

"This camera is a perfect example of NASA saving cost by using commercial-off-the-shelf hardware for space applications. The only modifications to the COTS hardware were a lubrication change and the addition of a thermal blanket," said Dena Haynes, NASA camera project manager. "The camera team did an excellent job getting this camera certified for space in a relatively short time frame."

The primary functional differences between the Nikon F3, the EVA camera now in use, and the Nikon F5 cameras are the auto focus and the matrix metering capabilities, both of which are expected to improve the quality of pictures taken during space walks.

The new auto focus capability of the F5 camera allows the astronaut to focus the camera on the subject by depressing the shutter release button halfway. This is a significant improvement over the manual focus required with the EVA F3 camera.

The matrix metering capability of the F5 measures scene brightness, scene contrast, and the focused subject's distance using the camera's 5-segment matrix metering sensor. This helps improve the quality of the pictures by providing correct exposure even in

extremely complex lighting situations such as those often encountered during space walks.

Certification of the new EVA camera required replacement of the existing lubricant in the camera and lenses with a non-migrating lubricant. NASA worked closely with Nikon to modify the commercial F5's for use in space by replacing the existing lubricant with one that can withstand very cold temperatures. The thermal range that cameras encounter during space walks is between -50 degrees C and 110 degrees C. The camera team worked closely with the Thermal Analysis Group to ensure that the camera would be kept within its operational temperature range. A "one hour flaps open flight rule" on the thermal cover for the lens was established.

The camera hardware team worked with the soft-goods lab to design a thermal blanket to protect the camera from the

harsh environment of space. A unique feature of the thermal blanket is that the shutter release button was designed into it. A grommet was placed over the camera shutter release button to allow the astronauts to take the picture. The camera thermal blanket is made of the same material as the spacesuits, thus providing the same protection.

The thermal blanket also has a lens cover which helps keep the Nikon F5 within operational temperatures. In addition to protecting the camera from the extreme temperatures experienced in space, the lens cover reduces the number of inadvertent bad exposures since the Nikon F5 will not take a picture unless it is focused on an object.

With the exception of an action viewfinder (which gives space walkers a larger viewing area), the Nikon F5 camera will be used for both EVA and IVA. In addition to the Nikon F5 camera, the

lenses certified for EVA use are the 28mm, 35mm, and 50mm Nikon lenses. Having one camera for both IVA and EVA will reduce the time needed to train crews in the use of photographic equipment. Starting with STS-101 and subsequent flights, the Nikon F5 will be the only 35mm camera on board.

EVA crewmembers including Michael Foale (STS-103), Jeffrey Williams (STS-101), Joe Tanner (STS-97) and Carlos Noriega (STS-97) were instrumental in the evaluation of the thermal blanket's ergonomic design. Their recommendations were incorporated into the final design. These astronauts were able to evaluate the thermal blanket in the EVA glove-box and in the Neutral Buoyancy Laboratory. The response from the crewmembers has been positive.

STS-103 Payload Commander Steve Smith used the new camera during the recent Hubble servicing mission.

"The F5 EVA camera is a dramatic improvement over the F3," said Smith. "On STS-82 using the F3, I was not sure if the subject, Mark Lee, was ever well framed in the picture. Getting good composition involved a lot of luck. In comparison, the F5 has a large viewfinder, which I found easy to look through. Because exposure on the F3 was fixed during large swings in lighting during the EVA, a large percentage of the pictures were not properly exposed. The F5 has a very sophisticated exposure control system that adjusts for each picture. We also have found on many EVAs that the F3 took many unintentional pictures when it was bumped; the F5, conversely, will not do this when the MLI lens cap is in place.

"Taking pictures with a handheld camera during an EVA, especially if you are the person not on the shuttle arm, is a challenging, time-consuming task. The F5 makes the task much easier and the results are a quantum leap better." ■



Astronaut Steve Smith, payload commander, takes a picture with an F5 camera during the final EVA of the STS-103 mission.

Human-rated thermal vacuum chamber made roomier

Astronauts and test directors have 132 percent more room for equipment and maneuverability in the thermal vacuum chamber since the installation of a new traversing rail last summer.

The human-rated thermal vacuum chamber, built in the '60s and a National Historic Landmark since 1985, has been the site for hundreds of tests for space flight hardware and crew operations at JSC. Its capability to incorporate humans in the thermal vacuum environment is unique in the world, making it a workhorse for the space program. But the growing scope of the space program from the International Space Station assembly schedule has caused increased demands for testing. Faced with a growing docket of new and bigger hardware to be tested, it became evident a solution was needed.

After some assessment, it was determined that more than half of the chamber was inaccessible by crewmembers in its original configuration. The crewmembers relied on an overhead rail to absorb the 300-lb weight of the spacesuit in the chamber so they were limited to going only where the rail was installed – a straight line from the chamber entrance directly across the chamber with a six-foot traverse to its left. Additionally, to get the crewmembers inside the chamber

from their suit-up area outside, a dated winch motor mechanism was used by the crewmembers to coast up the shallow incline into the chamber.

"It required a lot of energy from the crewmembers just to get into the chamber and the test hadn't even started yet," said Mary Cerimele, NASA test director. "Plus, using that mechanism put us only one cable away from a serious problem."

It was determined that adding another section of rail with a new ingress/egress system would solve many of the chamber maneuverability issues, increase the useable chamber area, while also improving the safety of the ingress.

Instead of having a rail that limited the crewmember's mobility to only the left-most side of the chamber (essentially a 6 x 12 foot corridor of the 490-square-foot chamber floor), the new design would allow crewmembers to traverse another eight feet to the right as well, and essentially reach more of the testing area.

"The new monorail increased our floor space by 132 percent," said Cerimele. "If we hadn't done this, we'd have to schedule more tests to accommodate all the testing needs. That costs money and has obvious schedule implications. There simply was too much to physically fit in where a crewmember could reach it, so

we had to limit the number and size of items that could be tested each time."

Prior to the addition, the chamber could accommodate about seven items per test. However, during their last test, which was the first one with the new rail system, they were able to complete testing on 11 components, three of which would not have fit in the old chamber layout.

The new system incorporates a chain drive to hoist the suited crewmembers up and down the gentle incline to the testing chamber. The mechanism is predicated on the same pin-and-chain system a roller coaster uses to hoist its load. The crewmember can complete the strenuous ingress and egress much more quickly and with no actions required by the crewmember because the attachment to the chain is now automated. The chain drive also now blocks an inadvertent coast down the incline during test, a hazard the test team previously had to rigorously control. A second framework, six feet above the first, also was installed for a pulley system to suspend the heavy crewmember tools during the test.

"It's safer and conserves the crewmember's energy," said Sam Garcia, one of the facility mechanical engineers. Garcia was an integral part of the redesign team to

engineer the new rail and support system. He also was the first human subject for the system's acceptance testing.

"The engineers and technicians who put this together were exceptional," said Cerimele of the team, some of whom worked 80-90 hours a week designing and building the new stainless steel framework. "They had this built and certified in a couple of months. That is a very short time for such a major redesign."

Designing hardware for the hostile environment of the chamber, which has a temperature range of minus 200 °F to plus 250 °F or higher, presented unique challenges. Special motors had to be installed that could operate remotely to test the system before the human tests. And each of the motor actuators has to be warmed to ensure they can operate in the frigid temperatures.

"The new rail represents a long-awaited capability for our facility," added Cerimele, "and is in keeping with a faster, better, cheaper way of doing business."

The team is preparing for its next chamber test, which is set for later this spring. In the meantime, the chamber will be getting its next enhancement – a new video monitoring system, which should be installed this month replacing the old black-and-white system. ■

COMMUNITY NEWS**Get ready to rodeo**

It's time for JSC employees to dust off their 10-gallon hats and shine their spurs for the upcoming rodeo season. The center will sponsor a variety of activities throughout the rodeo season. Working in concert with the NASA/Clear Creek/Friendswood Go Texan committee, JSC hopes to support the commitment to youth and education.

On February 2, performers from the Houston Livestock Show and Rodeo speakers committee will entertain employees during lunchtime in the Bldg. 3 cafeteria. Performances will include country and western singers, western bands, live animals, ropers (give it a try), rodeo clowns, and line dancers. Come on down and enjoy the free entertainment while you munch on the western-themed lunch specials at the cafeteria. Don't forget to wear your cowboy duds!

The monthlong festivities will continue with the arrival of the Texas Independence Trail Riders at 3 p.m. February 8. The trail riders will enter JSC through the Space Center Houston tram underpass by the Longhorn Project pasture. The JSC Circle Riders and Precinct 8 mounted patrol will meet them as they enter JSC.

About 150 horses and riders and 10 to 15 wagons will ride through the center, passing by the JSC Child Care Center and stopping at the Gilruth Center. The Texas Independence Trail Riders will set up camp for the night in the wooded area near the pavilion.

The NASA/Clear Creek/Friendswood Go Texan committee will host a dinner dance from 7 p.m. to 11 p.m. February 8

at Space Center Houston. This event will serve as the official welcome to the trail riders. Enjoy dining and dancing with Southern Way Band with Jerry Hart. The theme for this year's dance is "Mission Millennium - The Trail Ride." Tickets cost \$20 and include a barbecue dinner, two drinks, live music, plus the exhibits for viewing at Space Center Houston.

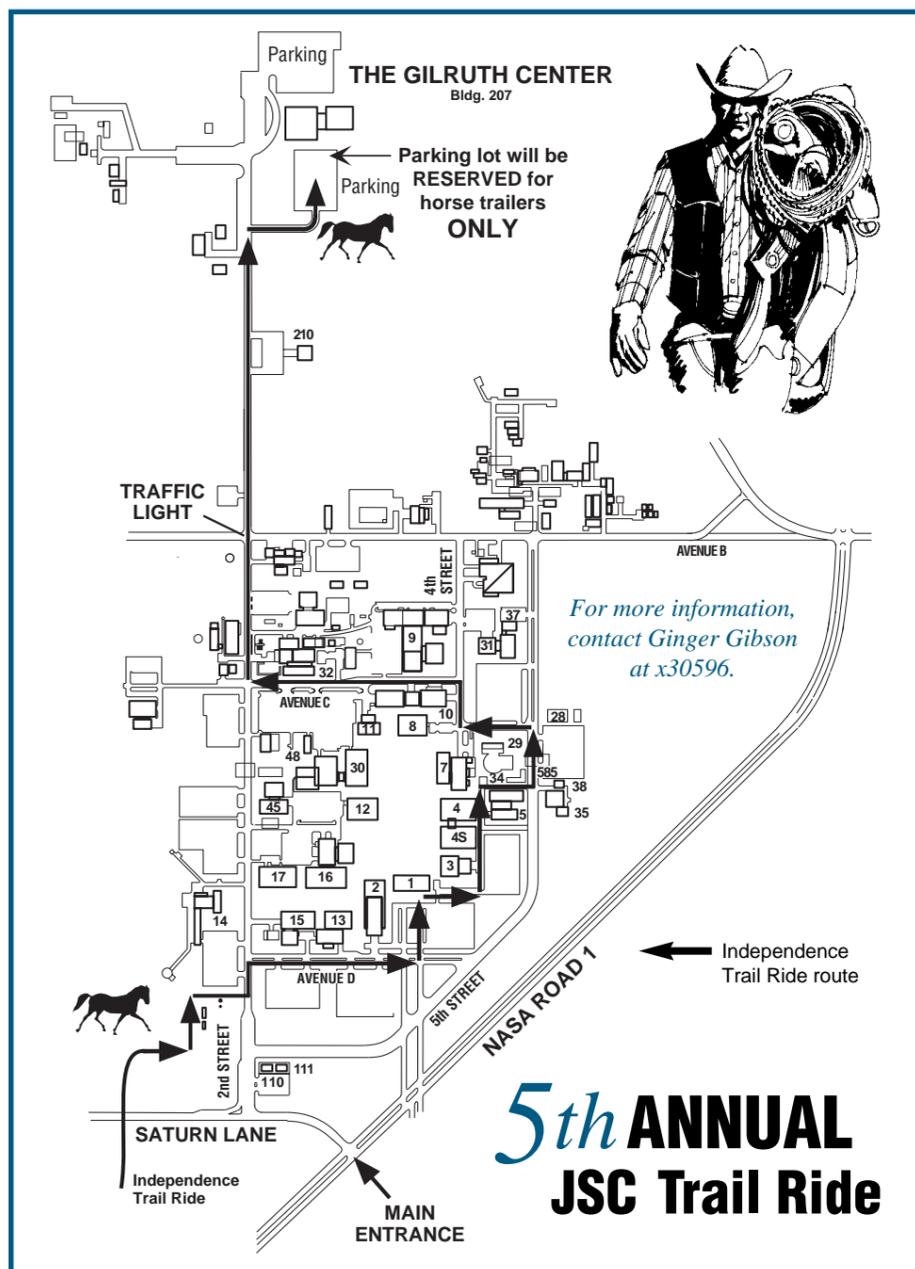
Tickets are available at the Exchange Stores. Proceeds go to the scholarship program of the Houston Livestock Show and Rodeo to help provide seven \$10,000 scholarships to NASA-area high school seniors for their college education.

The trail riders will depart JSC the next morning at 9 a.m. through Gate 4, near the 300/400 area, and travel through Clear Lake City on their way to their next overnight stop in Deer Park.

The Houston Livestock Show and Rodeo runs from February 18 to March 5. Once again NASA will be represented at the Houston Livestock Show and Rodeo Astrohall. Selected exhibits showcased from JSC's Inspection99 will adorn a 6,000-square-foot area on the west side of the Astrohall, and the new Technology Transfer exhibit trailer will be open for tours to educate the public on the "Benefits from Space." Contact Sandy Griffin at x31056 if you would like to help staff the exhibit.

Employees are encouraged to dress western every Friday during rodeo.

The Employees Activities Association in the Bldg. 11 Exchange Store will sell tickets to the rodeo performances. Call x35352 for more information. ■

**Children's art calendar 2000** *fun, yet serious*

By Mary Peterson

Few things are as irresistible as children's artistic impressions and expressions - truthful, uninhibited, unselfconscious, never constrained by the standards adults apply to themselves. This spontaneity is the underlying charm of the Safety & Total Health Children's Art Calendar, now in its fourth year of production, and one of the most popular publications at JSC.

Winners of this year's calendar contest, 36 in all, along with parents and siblings, were treated to an awards party recently at Gilruth Center, which afforded a rare glimpse into the personalities of the creative kids who want us all to be safe and healthy throughout the coming year.

"How did you get the idea for your drawing?," a question put to Erich Paulos, 7, brought the response of experience. "Because I put a Beanie Baby on top of a lamp, and it almost caught on fire!" His poster, storyboard style, follows the smoking toy atop a lamp, to the sound of the smoke alarm, to the recommendation, "Put your Beanie on your bed instead of a lamp!," to the final admonition, "Play safe." Looking a little sheepish, Erich said he would never put a Beanie Baby on a lamp again.

Macy Osoria, 8, chose Christmas outdoor lighting as a theme because in her words, "I live in a biggggg house, about 10 rooms, that my friends get lost in (but I don't), and I thought about alllll those lights outside and that they could catch on fire!" Her poster very cleverly reminds "NOElectrical plugs overloaded."

Others, such as Herbert Henderson III, 10, Jennifer Reister, 8, Kristin Sherman, 9, and John Cao, 7, based their pictures on repeated warnings and teachings of mom and dad, all sterling examples that safety is being taught, and effectively so, in the home.

While the calendar would seem at first glance to be a collection of happy pictures that mostly evoke a

smile, one drawing catches the eye because of its serious subject - a car skidding perilously off a road with the sobering reminder, "Seat belts saved my family's lives December 25, 1998." Only 7 years old at the time, the near tragedy left an indelible impression on Codi Elizabeth Land, the young artist.

It was Christmas Eve, and the Land family was traveling to Sherman, Texas, on an urgent mission to see their dying grandfather one last time. Early weather warnings had indicated an ice storm was imminent, but the Lands thought they could arrive at their destination ahead of it. Nearing Sherman, they followed behind a trailer, all the while keeping a wary eye on the increasingly ice-slick road. Codi and her older sister, Christi, were riding in the back seat when the younger girl became uncomfortable and restless. Her seat belt was unbuckled for some

temporary relief, when Christi suddenly noticed the trailer traveling in an unwieldy manner. She quickly re-buckled her sister's seat belt and placed a pillow between them.

Seeing the increased swerving of the trailer, the girls' dad attempted to pass but lost control when changing lanes on the icy road. Mom gasped. Then, the unthinkable happened. The car flipped and rolled several times, landing upside down in a ditch. So crushed was the vehicle that the driver of the car following warned his passengers, "Don't get out. I'm sure they're all dead." The police, firemen, and Emergency Medical Services team could only wonder at their survival. Although there were injuries, some severe, the Land family is whole, thanks to the use of seat belts.

This is just one of many stories that this year's calendar holds and was among those celebrated at the winners' party. Kids were treated to refreshments and a very entertaining session with "Gismo," the Houston Police Department's lively, remote-controlled robot that not only talked about safety, but danced a mean macarena with them as well. Winners received a medal and a T-shirt personalized with their own artwork, while Astronaut John Casper provided autographed pictures. SR&QA's Perry Bennett served as master of ceremonies. ■



Codi Land and John Casper

Technology Outreach Program to expand after early success

Program continues to help innovations become reality

Success stories continue to pour from the Technology Outreach Program, which just wrapped up its first year of operation.

The program, a partnership between JSC and the Clear Lake Area Economic Development Foundation, recently introduced two new medical devices that will help save many lives and benefited from NASA expertise.

With the help of TOP partners, Dr. Alan Ulert and business partner Henry Lang brought to fruition two products they had been struggling with. The two inventors had conceptual ideas and blueprints for both devices but needed technical expertise to finalize development.

The first was a disposable diaphragm system for stethoscopes, which will protect patients from cross-contamination from other patients – a problem that causes 20,000 deaths annually. The men needed help developing an easy way for the doctors to use the device. Northrop Grumman's Gary Doerre and Norman Gabbard stepped in to help design a dispenser for the stethoscope diaphragms.

"It was an idea we had come up with many years ago," explained Lang of the stethoscope diaphragm system. "It was finally modernized with the help of Norm, Gary, and the TOP program. They were essential in development of the dispenser, which was the missing link."

A second device was designed to alert people nearby should the wearer become incapacitated. Called the Emergency Signal Device, it is a 'touchless' medic alert system that sounds an automatic audio message and alerts emergency medical professionals should the wearer become unconscious or incapacitated. The device will be particularly useful to retirement communities and Alzheimer's facilities.

"We had a problem developing a prototype," explained Dr. Ulert. "We needed someone with expertise in electronics to tie all the parts together."



NASA JSC Photos JSC2000-00167 and S99-15878 by James Blair

Bob Arnett, general manager of PSI Automation, discusses the production of his firm's air motors with State Representative John Davis and Technology Outreach Program Executive Director Cathy Kramer. The Disposable Diaphragm for Stethoscopes, photo front, is another recent TOP success story. The device will provide a convenient method for physicians to protect their patients from cross-contamination.

Jerry Erickson and Frank Davis from Hernandez Engineering were able to help the team within just a few months.

"Technically, it was a fun project to work on," said Davis. "We installed a microprocessor to measure the vibration and impact sensitivity, and fine tuned its behavior a bit. It was a neat opportunity to work with some different sensors and other technologies I had read and heard about."

TOP also was able to help another small company that was struggling with loud noise from air motors.

PSI Automation, based in Seabrook, needed assistance diagnosing and reducing the ear-splitting 115-decibel noise from the powerful air motors it manufactures. Through TOP, PSI was matched up with JSC contractor Johnson Engineering. Its parent company, Spacehab Corp., is

responsible for many shuttle payloads and some of the International Space Station truss structures.

Because the standard silencer that PSI Automation had been using to lower noise generated by its air motors was not bringing the decibel level down to within specifications, the firm asked engineers from Johnson Engineering to help them design new mufflers. During the interim, before engineers could visit PSI to test the motors, another company developed a new muffler. So Johnson Engineering did a comparison testing of the two mufflers.

"Because Johnson Engineering is the main contractor for the acoustics for the space station, we took on this responsibility," said Gregory Pilkinton, Johnson Engineering civil engineer who served as the team leader. He and his team used a high-tech sound analyzer and microphones normally used to test sound levels generated by equipment for the space station to run extensive tests on the two mufflers.

The tests showed that the newer design was much more effective at blocking sound, lowering the noise down to 78 decibels. The tests also showed that the motor blades were generating much of the noise. After the testing and analysis, Pilkinton and his team delivered a 13-page report to PSI Automation.

"For our part, we produced a report that PSI employees can use with their mufflers when they go out to market and sell their products," said Pilkinton. "For follow-on work, if PSI were to put a resonator in front of the mufflers, they may be able to decrease the fan-blade tone and drop down the overall spectrum even more."

TOP has just completed its first year in operation and has assisted more than 30 organizations, from tennis court manufacturers to toy companies, overcome technical and design challenges.

"The space program is really the people's program – it belongs to the public," said JSC Director George Abbey, who attended the TOP press conference January 10 at PSI Automation. "The thing that is good about the Technology Outreach Program is that it gives us the opportunity to give back to the public."

All this success from the TOP program is garnering attention from the political arena. Also present at the PSI press conference were U.S. Representative Nick Lampson, State Senator Mike Jackson and State Representative John Davis. In fact, the response to TOP sparked State Representative John Davis to sponsor a bill that would expand the TOP into five neighboring counties. Governor Bush signed the bill in July 1999.

"During the first year of the TOP, we focused solely on serving the Clear Lake area to see if the program would spark interest in the community," said TOP Executive Director Cathy Kramer. "With the passage of House Bill 2992, the program will expand its scope and make NASA resources available to more of our state's entrepreneurs and small businesses."

Kramer added that Houston Mayor Lee Brown has been very supportive of the program and expanding it into Houston.

"Part of our new strategy will be to promote the program to the counties through education of the county judges, commissioners and county economic forums and chambers of commerce," explained Kramer. "We will also concentrate heavily in industrial areas such as the ship channel, Port of Houston, Port of Galveston, Pearland, and Texas City."

For more information on the TOP or to apply for assistance, call Kramer at CLAEF at (281) 486-5535.



NASA JSC Photo S99-15881 by James Blair

More and more businesses and entrepreneurs are reaping the benefits of the Technical Outreach Program. Shown here, left to right, are Jim Reinhartsen, Clear Lake Area Economic Development Foundation president, Cathy Kramer, TOP executive director, and State Representative John Davis pose next to Henry Lang holding a dispenser for disposable stethoscope covers, one of the latest TOP products. To Lang's right are Dr. Alan Ulert, co-designer of the device, and Gary Doerre and Norman Gabbard, consultants from Northrop Grumman.

JSC astronomers share stellar views with local students

Members of the Johnson Space Center Astronomical Society last month shared their enthusiasm for stargazing with the Clear Creek Independent School District Brookside Intermediate Science Club members.

After introductory explanations by Frank Cooper, former director of Burke Baker Planetarium, the students enthusiastically rushed out onto the darkened athletic field for a close-up view of the heavens. The students were particularly interested in getting a look at Jupiter and Saturn.

The eager observers lined up at the half-dozen telescopes Astronomical Society members had set up, but most chose to share their observations together by watching a live video feed using a standard 8mm video camera mounted on one of the instruments, an 8-inch Celestron telescope. The colorful bands on Jupiter's disc and several moons were easily seen. The most popular image was a closeup of Saturn and the band structure of its ring.

"For many of the students, this was their first experience viewing the skies through a telescope," said Kathy Johnson, science teacher and advisor to the Science Club. "Students, parents, and teachers were awestruck by the clarity of the views available to them in the magnificent telescopes."

NASA electrical engineer Tim Lawrence, a JSCAS member who participated in the event, remembers the impact of such telescopic views. "I remember, at the age of five, my first look through a telescope at the moon. That breathtaking experience launched my career with NASA. The JSCAS is composed of individuals with similar stories to tell, and we desire to give others the opportunity to have the same breathtaking experience."

This was the second opportunity in 1999 for the Brookside Science Club members to benefit from the knowledge and generosity of their NASA neighbors. At a recent meeting under the direction of Mike Laible, a NASA volunteer, 150 students constructed rubber band-powered airplanes made from balsa strips and tissue paper, culminating in a test flight for accuracy.

The Brookside Science Club meets monthly for 90 minutes after school. Those interested in sharing their expertise

on science with the club may contact Johnson at 281-482-9710.

The JSCAS is an association of amateur astronomers dedicated to the study and enjoyment of astronomy. The club supports special interest groups, holds public star parties and hosts special events like the Brookside Intermediate star party. Besides Brookside, JSCAS has held special event star parties and made presentations to teacher conferences, elementary schools, and Boy Scout and Girl Scout troops. The club holds public star parties on a regular basis at Moody Gardens and Challenger Park.

The club usually meets at 7:30 p.m. on the second Friday of the month at the Lunar and Planetary Institute, 3600 Bay Area Boulevard. The club is open to anyone interested in astronomy. No dues are charged.

For more information and a complete calendar of events visit the JSCAS Web site at <http://www.ghg.net/cbr/jscas/> ■



NASA JSC Photo S99-15580

Tim Lawrence, a member of the Johnson Space Center Astronomical Society, talks to Science Club members at the Brookside Intermediate star party. The sixth, seventh and eighth-grade students caught a glimpse of Jupiter and Saturn on a TV monitor with the use of Lawrence's telescope.

Benefits realized from new maintenance philosophy

It's a better, faster, and more economical approach to maintain everything from pumps to aircraft to spacecraft to submarines. The Navy uses it to evaluate the designs of all new ships. The electric utility industry has been using it since 1991 in both substations and line maintenance. NASA has long used it to analyze the space shuttle and shuttle support systems. And since the early 1990s, NASA has used it as a philosophy to maintain facilities and equipment.

It's called Reliability-Centered Maintenance or RCM. This unique method of maintaining equipment to ensure availability at the lowest possible cost was first documented in a book written by two airline industry executives and published in 1978. The authors proposed an approach to maintaining aircraft based on developing a maintenance program that assured the maximum safety and reliability of equipment at the lowest cost.

NASA facilities officials initiated RCM at JSC six years ago. Since April 1997, Brown and Root Services Pioneer has implemented this program under a fixed price contract. Under the terms of the contract, BRSP is responsible for maintaining all facilities as well as facility-based and some user equipment across JSC, including Ellington Field and the Sonny Carter Training Facility.

Under RCM, proactive maintenance costs may increase, but overall availability and reliability of equipment also increases. As a result, profit margins also increase.

Such has been the experience at JSC. Equipment availability and reliability across the center has increased. Since RCM was implemented under BRSP, monthly routine trouble calls on equipment have dropped by 50 percent.

A NASA Headquarters-sponsored consultant, William Steele of Enviro-Management & Research, Inc., recently visited JSC to assess the center's RCM program. Preliminary results were very



NASA JSC Photo S99-15013 by James Blair

Brown and Root Services Pioneer employee Zane Patterson conducts a vibration test on a chiller in Bldg. 48.

favorable. In fact, at the time of the evaluation this past September, JSC scored the highest rating among all of the NASA centers included in the assessment.

"Reliability-Centered Maintenance at JSC has been extremely successful due in part to the expertise, dedication and priority Brown and Root Services Pioneer, in conjunction with NASA-JSC, has placed on the program's implementation," said Beth Humphries, NASA division chief, Facilities Engineering Division. "This is an example of partnering efforts between government and contractor which result in programs that are technically sound, cost-effective and mutually beneficial."

Steele evaluated JSC in eight areas including maintenance philosophy, performance measurements, program organiza-

tion, preventive maintenance, and training and development. His evaluation states that RCM is the "cornerstone" of JSC's maintenance and repair program.

RCM requires a shift in mindset for personnel that maintain facilities and equipment, from focusing on reparative maintenance – maintaining equipment according to a predetermined schedule and repairing or replacing items when they fail – to a more proactive maintenance approach using high-tech monitoring processes including vibration analysis and infrared thermography to monitor the state of equipment to predict failures and schedule corrective maintenance before failures occur.

"In the past, maintenance was performed on time-based intervals," said Doug Conover, NASA facility engineer

and RCM lead for JSC. "It is apparent that varying usage of the same types of equipment results in different life spans and requires different applications of maintenance techniques."

Also, the mission criticality of equipment plays an important role in the degree of maintenance needed. One piece of equipment that is not used as much as another could require less maintenance. "Effective maintenance practices using the RCM philosophy result in cost-effective maintenance that places the focus on critical equipment run times instead of a strict time-based preventive maintenance program," said Conover.

A key element of RCM is condition monitoring – continuous or periodic monitoring and diagnosis of systems to forecast equipment failures. Also called predictive maintenance, condition monitoring can be useful in averting costly unplanned equipment failures and the resulting downtime.

"For years, we made heroes out of those mechanics who could get equipment back on line the quickest," said Wayne Powell, BRSP RCM manager at JSC. "Most of the time they did not look to see what caused the equipment to fail. So down the road the equipment would fail again. Under RCM, the hero is the one who can stop the failure mode from happening."

"With RCM, we are watching trends and monitoring degradation points. And when repairs are needed, they can be planned and performed during off-hours so that we don't impact use of the equipment."

Since contract inception more than two years ago, BRSP has invested \$1 million to train its people in RCM processes and procedures and to purchase the hardware and software necessary to conduct RCM for the center. BRSP operations and maintenance personnel had to go through RCM training, which taught them the importance of predictive testing and inspection techniques to prevent unplanned failure. ■

Ripped from the ROUNDUP

Ripped straight from the pages of old Space News Roundups, here's what happened at JSC on this date:

1 9 7 0

A man who lost his son at sea and has since dedicated himself to the development of water accident and survival equipment, plans to market the special life raft carried aboard all U.S. human spacecraft.

His long search for equipment that might have saved his son's life ended with the discovery that NASA holds a patent for just such a life raft.

Now Robert J. Perchard, of Bourne, Mass., as an individual entrepreneur, has obtained an exclusive, royalty-free patent license from NASA to manufacture and sell an inflatable life raft developed for use in the manned space flight program.

The inflatable, non-tippable raft with a radar reflective surface was developed by NASA during 1959-61 for the future needs of astronauts' safety. The raft was made part of the personal survival equipment aboard all human spacecraft vehicles.

1 9 8 0

The Orbiter Integrated Test, which was completed on Friday, January 18, put *Columbia* through all phases of a mission and was described by test officials at KSC as a "total success."

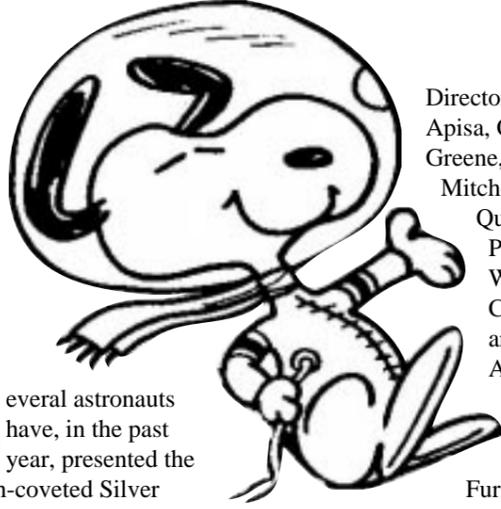
After the test, prime crew member Astronaut Robert Crippen said, "The shuttle is a really spectacular machine which will do a lot for this country." Fellow crewman, John Young said the *Columbia* performed "like a champ."

1 9 9 0

Columbia, shimmering in the early morning glow of Edwards Air Force Base runway lights, returned to Earth on Saturday after accomplishing its goals and setting space shuttle endurance and landing weight records.

The Orbiter and its crew – Commander Dan Brandenstein, Pilot Jim Wetherbee, and Mission Specialists Bonnie Dunbar, Marsha Ivins, and G. David Low – landed in California at 3:35 a.m. CST Saturday after spending 10 days, 21 hours and 38 seconds in orbit.

Astronauts present Silver Snoopy awards



Several astronauts have, in the past year, presented the much-coveted Silver Snoopy Award to seventy-five JSC employees.

Civil service employees honored with Silver Snoopy awards are Lisa Navy, Office of the Director; Scott Wood, Human Resources Office; Billie Deason, Public Affairs Office; Carol Neeley, Office of Procurement; John Yaniec, Flight Crew Operations Directorate; Robert Force, Aaron Goldenthal, Michael Jensen, Leong Lew, Randall McDaniel, and Deborah Musgrove, Missions Operations Directorate; Michael Fowler, Heather Hinkel, Steve Martin, Calvin Schomburg, William Spenny, Emily Strickler, Scott Swan, Keith Van Tassel, and Lui Wang, Engineering Directorate; Kenneth Woodfin, Information Systems

Directorate; David Hickens and Dominic Apisa, Center Operations Directorate; Jay Greene, Raphael Grau, Lois Lenox, Brian Mitchell, Warren Pattison, and Naveen Quraishi, International Space Station Program; and Dave Baker at the White Sands Test Facility.

Contractor recipients of the award are Gerard Nault, Air-Lock; Edwin Alberson, John Claffy, David Huskey, Antonio Mirabel, Claire Rasmussen, Martin Reffner, Thomas Rethwisch, Furman Smith, and Ben Swartz, Honeywell; James Stramler, Barrios Technology; Philip Shannahan, Blackhawk Management Corporation; James Auman, Robert Boyle, Eric Newman and Donna Ray, Hamilton Sundstrand; Todd Gauer, Hernandez Engineering Inc.; Patricia Donnelly, ILC-Dover; Alicia Gaskin, Mark Ovesny, Gillian Parker, Tyson Richmond, and Lawrence Thomas, Johnson Engineering Company; Paul Goodwin and Teresita Greenfield, L&M Technologies; Jeff Hoblit, Ken Huffman, and Erin Orgeron, Lincom Corporation; Henry Ansley, Dee Ann Haney, Margaret Klee, Eric Perry, Donald Woeltjen, Lockheed Martin Space Mission Systems & Services; Barry Martin, Raytheon; Kevin Berry,

Eric Clark, Michael Moore, Melinda Mudd, and Michael Penney, Science Applications International, Inc.; Ludmilla Tsurikova, Tech Trans International, Inc.; Roscoe Lee, TRW; Emiko Lee, Tsukuba Space Center in Japan; Michael Knapp and Donald Reed, United States Army; and Annie Lenhart at the United States Embassy in Paris, France.

The Silver Snoopy Award, administered by the Space Flight Awareness Program, is the astronauts' personal award to individuals who have performed an outstanding effort contributing to the success of human space flight missions. Since the Snoopy represents the astronauts' own recognition of excellence and less than one percent of the NASA and contractor workforce is given the award, receiving it is a special honor.

More Silver Snoopy presentations are planned this year. An indication of a surprise presentation is the special blue Snoopy "Symbol of Excellence" poster on display in work areas. Any individual whose job performance has contributed significantly to flight safety and mission success is eligible for this very special award. ■

GILRUTH CENTER NEWS

Sign up policy:

All classes and athletic activities are on a first-come, first-served basis. Sign up in person at the Gilruth Center and show a yellow Gilruth or weight room badge. Classes tend to fill up two weeks in advance. Payment must be made in full, cash or by check, at the time of registration. No registration will be taken by telephone. For more information, call x33345

Gilruth badges:

Required for use of the Gilruth Center. Employees, spouses, eligible dependents, NASA retirees and spouses may apply for photo identification badges from 7:30 a.m.-9 p.m. Monday-Friday and 9 a.m.-2 p.m. Saturdays. Cost is \$10. Dependents must be between 16 and 23 years old.

Open from 6:30 a.m.-10 p.m. Monday-Thursday, 6:30 a.m.-9 p.m. Friday, and 9 a.m.-2 p.m. Saturday. Contact the Gilruth Center at (281) 483-3345. <http://www4.jsc.nasa.gov/ah/exceaa/Gilruth/Gilruth.htm>

Nutrition intervention program: Six-week program includes lectures, a private consultation with the dietitian and blood analysis to chart your progress. Program is open to all employees, contractors and spouses. For details call Tammie Shaw at x32980.

Defensive driving: One-day course is offered once a month at the Gilruth Center. Pre-registration required. Cost is \$25. Call for next available class.

Stamp club: Meets every second and fourth Monday at 7 p.m. in Rm. 216.

Weight safety: Required course for employees wishing to use the Gilruth weight room. Pre-registration is required. Cost is \$5. Annual weight room use fee is \$90. The cost for additional family members is \$50.

Exercise: Low-impact class meets from 5:15-6:15 p.m. Mondays and Wednesdays. Cost is \$24 for eight weeks.

Step/bench aerobics: Low-impact cardiovascular workout. Classes meet from 5:15-6:15 p.m. Tuesdays and Thursdays. Cost is \$32 for eight weeks. Kristen Taraszewski, instructor.

Yoga: Stretching class of low-impact exercises designed for people of all ages and abilities in a Westernized format. Meets Thursdays 5-6 p.m. Cost is \$32 for eight weeks. Call Darrell Matula, instructor, at x38520 for more information.

Ballroom dancing: Classes meet Thursdays from 6:30-7:30 p.m. for beginner, 8:30-9:30 p.m. for intermediate and 7:30-8:30 p.m. for advanced. Cost is \$60 per couple.

Country and western dancing: Beginner class meets 7-8:30 p.m. Monday. Advanced class (must know basic steps to all dances) meets 8:30-10 p.m. Monday. Cost is \$20 per couple.

Fitness program: Health-related fitness program includes a medical screening examination and a 12-week individually prescribed exercise program. For details call Larry Wier at x30301.

Aikido: Martial arts class for men and women meets 5-6 p.m. Tuesdays and Wednesdays. No special equipment or knowledge is needed to participate. Aikido teaches balance and control to defend against an opponent without using strength or force. Beginning and advanced classes start each month. Cost is \$35 per month.

TICKET WINDOW

The following discount tickets are available at the Exchange Stores

General Cinema Theaters	\$5.50
Sony Loew's Theaters	\$5.50
AMC Theaters	\$5.00
Moody Gardens (2 events) (does not include Aquarium Pyramid)	\$10.75
Moody Gardens (Aquarium only)	\$9.25
Space Center Houston	adult .. \$11.00 .. child (age 4-11) ... \$7.25 (JSC civil service employees free.)
Space Center Houston annual pass	\$18.75
Postage Stamps (book of 20)	\$6.60
Clear Lake Coupon Books	\$30.00

Please bring your driver's license to pay by personal check.

Exchange Store hours

Monday-Friday
Bldg. 3 7 a.m.-4 p.m.
Bldg. 11 9 a.m.-3 p.m.

- All tickets are nonrefundable.
- Metro tokens and value cards are available.
- Franklin Planners now available.

For additional information, please call x35350.

ROUNDUP
Frosch, Yardley cover new space technology in STS development

Shocking news for the millennium:

JSC provides automated external defibrillators on site as part of 'Got the Squeeze, Call the 33333s' campaign

About 250,000 people die each year from sudden cardiac arrest. When cardiac arrest occurs, the victim loses consciousness, has no pulse, and stops breathing. Without intervention, death follows within minutes. Cardiac arrest usually results from some underlying form of heart disease. Most cardiac arrests are due to abnormal heart rhythms called arrhythmias. Ventricular fibrillation is the most common arrhythmia that leads to cardiac arrest. Statistics show that for every minute in which no cardiac intervention is given, survival decreases by 7-10 percent. The sooner that skilled help arrives, the better the chance for saving lives.

To aid JSC employees in the event of sudden cardiac arrest, and as the final phase of the JSC Space and Life Sciences "Got the Squeeze, Call the 33333s" heart disease awareness campaign, automated external defibrillators, AEDs, are being installed at select locations across the center. The AED is a new and important device used in emergency cardiovascular care. AEDs are accurate, easy to operate and have saved many lives. They can be used effectively by lay people with minimal training.

The AED, a microprocessor-controlled, battery-operated device, is used to administer an electric shock through the chest wall to the heart to restore a regular heartbeat. Built-in computers assess the patient's heart rhythm, judge whether defibrillation is needed and then administer the shock as appropriate. Audible and/or visual prompts guide the trained user through the process.

JSC is believed to be the first NASA center to place AEDs in the workplace. They will provide an excellent compliment to the center's advanced cardiac life support ambulances operated out of the JSC Clinic.

The American Heart Association recommends "public access defibrillation programs." This begins by ensuring that there are defibrillators or AEDs in all local emergency service response vehicles and ambulances. Second, the AHA recommends placing AEDs in public areas, for use by trained personnel, wherever a large number of people may congregate or in locations where there are "high risk" personnel or activities, such as health clubs or retirement homes.

Although several areas across JSC are being considered as potential locations for placement of AEDs, initially the devices



NASA JSC Photo S99-15370 and S99-15371 by James Blair

Employees who will be trained to use the automated external defibrillator and those who will train them include, from left, front: Charles Beckman (Kelsey Seybold, trainer), Mike Fox (Kelsey Seybold, trainer), Eddie Rodriguez (NASA Exchange); back: Greta Ayers (Kelsey Seybold), Al Young (Muniz Engineering), Larry Wier (Kelsey Seybold), Steve Arrington (Muniz Engineering).

will be placed in additional (other than ambulances) emergency responder vehicles and in identified "high risk" locations.

The greatest initial need at JSC is to have defibrillation capability on site 24 hours a day, 7 days a week. During normal working hours, the JSC Clinic ambulance responds with advanced cardiac life support anywhere on site. However, after-hours and on weekends, there is no on-site capability to respond to cardiac events. Medical response comes from the Houston Fire Department via 911.

In light of this, the first choice for AED placement was with the JSC fire protection



specialists and their vehicles. These specialists are on site 24 hours a day, 7 days a week and respond to all emergencies at JSC. By providing training to them and placing an AED in each vehicle, JSC will have defibrillation capability anywhere on site, 24/7, through the JSC "33333s" emergency response network.

The second site for an AED is the Gilruth Center. With the large number of employees, young and old, participating in sports and oftentimes after hours, placement

of an AED there is appropriate. JSC Employee Activity Association and Health-Related Fitness Program employees will be trained to use the AED.

As part of "Public Access Defibrillation," AEDs are being placed in many large public facilities where people are at risk. An example includes the airline industry, where AEDs have been installed in aircraft and airports across the country. In a recent AHA statement, American Airlines reported that since AEDs were placed on its aircraft, 16 instances of collapse with arrhythmias and cardiac arrest have occurred and 11 lives have been saved (68 percent); before AEDs were installed, the figure was less than 2 percent. Chicago's O'Hare and San Francisco's airports are examples of facilities that have installed AEDs and trained employees in their use.

Most AEDs are designed to be used by nonmedical personnel such as police, fire service, flight attendants, security guards and other rescuers who have been properly trained. Because of the wide variety of situations in which they will typically be used, AEDs are designed with multiple safeguards and warnings before any energy is released. However, there are potential dangers associated with AED use. That's why training-

including safety and continuing maintenance of the equipment is so important. At JSC, only people with proper training will use an

AED, and the devices will be placed in areas in which there will always be a trained operator available.

Wherever AEDs are placed, additional batteries, electrodes and first aid equipment will be made available to ensure that users have all of the necessary equipment in the event use of an AED is necessary.

As we move toward the new millennium, the JSC AED program is an example of the commitment to the continued health and safety of our JSC workforce. ■

Employees earn Space Flight Awareness Honoree Awards

Thirty civil service and contractor employees were among those from across the nation who were recently selected for NASA's Space Flight Awareness Honoree Award, the highest tribute paid to aerospace employees for commitment to mission quality and safety.

Although the highlight of their SFA event would have been viewing the launch of STS-103, unfortunately this was not possible due to further launch delays after the group arrived in Florida. However, the honorees did receive a VIP tour of the Kennedy Space Center and were guests of honor at a reception hosted by KSC

Director Roy Bridges. NASA and contractor management, as well as numerous astronauts, applauded their outstanding work and dedication to the space program. In addition, Astronaut Steve Swanson presented each honoree with a framed certificate and special honoree lapel pin at JSC's awards luncheon held during the event.

Civil service honorees were Mary O'Connell, Human Resources Office; Leo Benal, Lynda Estes, Michael Hughes, Toby Martin, and Bill Studak, Engineering Directorate;

Pat Bright and Heather Moncrief, Office of the Chief Financial Officer; Leasa Butler, Jessie Gilmore, and Tom Martin, International Space Station Program; Stacy Hale, John Maca, and Dawn Ward, Mission Operations Directorate; and Jim Maida, Space and Life Sciences Directorate.

JSC's contractor honorees were Antha Adkins, Mary Jensen, Jay Lipford, Eric Perry, Paul Romine, and John Speed, Lockheed Martin Space Operations; Gordon Baty, Kelsey-Seybold Clinic; Don Erwin, Barrios

Technology; Leo Hernandez, Honeywell (WSTF); Ernest Kahler, DynCorp, Johnson Support Division; Steve Miller, Neptec Design Group, Ontario, Canada; Jeff Robert, Hamilton Sundstrand Space Systems International, Windsor Locks, CT; Terry Torrance, BRSP; Barbara Trust, GHG Corporation; and Juan Zamora, DynCorp, IMPASS Support Division.

The next Space Flight Awareness Honoree event will be held at KSC in mid-March 2000 for the launch of STS-101. For more information on the Space Flight Awareness Program, contact Lois Walker at x38425 or visit <http://www.srqa.jsc.nasa.gov/sfa/> ■



DATES & DATA**February 1**

ASQ meets: The Bay Area section of the American Society of Quality will meet at 6 p.m. at the Ramada King's Inn on NASA Road One. No reservations are required. For more information contact Ann Dorris at x38620.

February 2

Astronomy seminar: The JSC Astronomy Seminar Club will meet at noon February 2, 9, 16 and 23 in Bldg. 31, Rm. 248A. For more information call Al Jackson at x35037.

Spaceteam Toastmasters meet: The Spaceteam Toastmasters will meet at 11:30 a.m. February 2, 9, 16 and 23 at United Space Alliance, 600 Gemini. For additional information call Patricia Blackwell at (281) 280-6863.

February 3

Communicators meet: The Clear Lake Communicators, a Toastmasters club, will meet at 11:30 a.m. February 3, 10, 17 and 24 at Freeman Library, 16602 Diana Lane. For more information call Allen Prescott at (281) 282-3281 or Mark Caronna at (281) 282-4306.

February 6

Warning System Test: The site-wide Employee Warning System will perform its monthly audio test at noon. For more information call Bob Gaffney at x34249.

Managers meet: Bob Chapman, an organizational development consultant, will be the featured speaker at the National Management Association luncheon at 11:15 a.m. at the Gilruth Center. For more information contact Cindy Neal at x32202 or visit www.jsc.nasa.gov/ot_nma/

February 8

Aero club meets: The Bay Area Aero Club will meet at 7 p.m. at the Houston Gulf Airport clubhouse at 2750 FM 1266 in League City. For details call Larry Hendrickson at x32050.

Space society meets: The Clear Lake area chapter of the National Space Society will meet at 6:30 p.m. at the Freeman Memorial Branch Library, 16602 Diana Lane. For more information call Murray Clark at (281) 367-2227.

NPMA meets: The National Property Management Association will meet at 5 p.m. at Robinette and Doyle Caterers, 216 Kirby in Seabrook. Dinner costs \$14. For more information call Sina Hawsey at x36582.

February 9

IAAP meets: The Clear Lake/NASA chapter of the International Association of Administrative Professionals will meet at 5:30 p.m. at Bay Oaks Country Club. Cost is \$16. For details and reservations call Tami Barbour at (281) 488-0055, x238.

February 10

Airplane club meets: The Radio Control Airplane Club will meet at 7 p.m. at the Clear Lake Park building. For additional information call Bill Langdoc at x35970.

MAES meets: The Society of Mexican-American Engineers and Scientists will meet at 11:30 a.m. in Bldg. 16, Rm. 111. For more information call George Salazar at x30162.

SSQ meets: Dr. Chuck Hoffman, Barrios Technology, will be the featured speaker at the Society for Software Quality brown bag luncheon. The event will be held at Barrios Technology, 2525 Bay Area Blvd., Ste. 300 at noon. For more information call Renne Peterson at 281 282-4392.

February 11

Astronomers meet: The JSC Astronomical Society will meet at 7:30 p.m. at the Center for Advanced Space Studies, 3600 Bay Area Blvd. For details call Chuck Shaw at x35416.

February 13

Westside NSS meets: The "Westside" group of the Clear Lake area chapter of the National Space Society will meet at 2 p.m. at Silicon Graphics, 11490 Westheimer, Suite 100. For more information call Murray Clark at (281) 367-2227.

February 15

AIAA meets: AIAA Life Sciences, Space Processes and Human Factors Technical Committee presents a "Lunch and Learn" event at 11:30 in Bldg. 37, Rm. 2. The featured presentation will be "Protection against Decompression Sickness on Mars" by Johnny Conkin, Ph.D. Call Karin Loftin at x41122 for reservations.

February 16

Scuba club meets: The Lunarfans will meet at 7:30 p.m. For more information call Mike Manering at x32618.

NASA BRIEFS**NASA SELECTS 25 SMALL BUSINESS PROJECTS**

America's space agency does more than explore space: It also stimulates small and disadvantaged businesses to develop new technologies. To this end, NASA has selected 25 research proposals for negotiation of Phase 2 contract awards for its Small Business Innovation Research Program. The total value of the awards is expected to be more than \$15 million and will be conducted by 25 firms in 12 states.

These selections will assist future NASA missions by providing advanced technologies in such areas as high-optical-quality, lightweight reflectors and mirrors; high-speed digital communications links with reduced power and size requirements; and reduced mass requirements for spacecraft thermal-control systems.

Phase 2 continues development of the most promising previously selected Phase 1 projects. Selection criteria include scientific and technical merit, future importance and eventual value of the innovation to NASA, company capabilities and commercial potential. Funding for Phase 2 contracts may be up to \$600,000 for a two-year performance period.

SBIR contractors submitted 319 Phase 2 proposals; 103 of these proposals were selected on August 27, 1999. Based on current budget availability, these additional 25 selections now are being announced. A listing of the selected companies can be found on the Internet at: <http://sbir.nasa.gov>

GALILEO FINDINGS BOOST IDEA OF OTHER-WORLDLY OCEAN

When NASA's Galileo spacecraft recently swooped past Jupiter's moon Europa, it picked up powerful new evidence that a liquid ocean lies beneath Europa's icy crust.

As the spacecraft flew 218 miles above the icy moon on January 3, its magnetometer instrument studied changes in the direction of Europa's magnetic field. Galileo's magnetometer observed directional changes consistent with the type that would occur if Europa contained a shell of electrically conducting material, such as a salty, liquid ocean.

"I think these findings tell us that there is indeed a layer of liquid water beneath Europa's surface," said Dr. Margaret Kivelson, principal investigator for the magnetometer. "I'm cautious by nature, but this new evidence certainly makes the argument for the presence of an ocean far more persuasive."

It appears that the ocean lies beneath the surface somewhere in the outer 60 miles, the approximate thickness of the ice/water layer, according to Kivelson, a researcher at the University of California, Los Angeles.

The new evidence was gathered during a flyby specially planned so that the observed position of Europa's north pole would make it clear whether or not it moves. In fact, the data showed that its position had moved, thus providing key evidence for the existence of an ocean.

Additional information and pictures taken by Galileo are available at <http://galileo.jpl.nasa.gov>

PAYLOAD SAFETY CONFERENCE

The Nassau Bay Hilton, Houston, will be the site of a Payload Safety Conference on February 23-25, 2000. The conference theme is "Mission Success Starts with Safety."

The objectives of the conference are to provide payload organizations with a common, accurate understanding of payload safety technical and process requirements, to foster synergy within the payload safety community, and to promote payload safety as the foundation for mission success. The conference is primarily intended for personnel responsible for the design and safety certification of International Space Station and shuttle payloads, including payload safety engineers, project managers, and technical support specialists.

General sessions will include presentations on payload safety challenges in the ISS era, the payload safety Data Management System, and

process and technical requirements for both ground and space flight safety. More specialized sessions will be offered on technical topics, including pressure systems and pressure vessels, batteries, materials, structures, fracture control, fire detection and suppression, extravehicular activity, toxicology, electrical power distribution, and bonding and grounding.

Dr. Bonnie Dunbar will address attendees at the conference luncheon on February 24.

The conference Web site is located at www.rsis.com/nasa/conference/intro/

If you have any questions, contact Michael Ciancone at 281-483-8848 or e-mail at mciancon@ems.jsc.nasa.gov.

SPACE CENTER Roundup

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